

1. Work requester fills out this section.

☐ Standing Work Permit

Requester: Don Lynch	Date: 06/28/2006	Ext.: 2253	Dept/Div/Group: PO/PHENIX
Other Contact person (if different from requester): S. Marino			Ext.: 3704
Work Control Coordinator: Don Lynch		Start Date: 07/17/2006	Est. End Date: 09/15/2006
Brief Description of Work: Install TOF West Detector Array			
Building: 1008	Room: IR	Equipment: n/a	Service Provider: PHENIX

WCC, Requester/Designee, Service Provider, and ES&H (as necessary) fill out this section or attach analysis

ES&H ANALYSIS					
Radiation Concerns		<input checked="" type="checkbox"/> None	<input type="checkbox"/> Activation	<input type="checkbox"/> Airborne	<input type="checkbox"/> Contamination
Radiation Generating Devices:		<input type="checkbox"/> Radiography	<input type="checkbox"/> Moisture Density Gauges	<input type="checkbox"/> Soil Density Gauges	<input type="checkbox"/> X-ray Equipment
<input type="checkbox"/> Special nuclear materials involved, notify Isotope Special Materials Group			<input type="checkbox"/> Fissionable materials involved, notify Laboratory Criticality Officer		
Safety Concerns		<input type="checkbox"/> None	<input type="checkbox"/> Ergonomics	<input type="checkbox"/> Transport of Haz/Rad Material	
<input type="checkbox"/> Adding/Removing Walls or Roofs	<input type="checkbox"/> Confined Space*	<input type="checkbox"/> Explosives	<input type="checkbox"/> Lead*	<input type="checkbox"/> Penetrating Fire Walls	
	<input type="checkbox"/> Corrosive	<input type="checkbox"/> Flammable	<input type="checkbox"/> Magnetic Field*	<input type="checkbox"/> Pressurized Systems	
<input type="checkbox"/> Asbestos*	<input type="checkbox"/> Cryogenic	<input type="checkbox"/> Fumes/Mist/Dust*	<input type="checkbox"/> Material Handling	<input type="checkbox"/> Rigging/Critical Lift	
<input type="checkbox"/> Beryllium*	<input type="checkbox"/> Electrical	<input type="checkbox"/> Heat/Cold Stress	<input type="checkbox"/> Noise*	<input type="checkbox"/> Toxic Materials*	
<input type="checkbox"/> Biohazard*	<input checked="" type="checkbox"/> Elevated Work*	<input type="checkbox"/> Hydraulic	<input type="checkbox"/> Non-ionizing Radiation*	<input type="checkbox"/> Vacuum	
<input type="checkbox"/> Chemicals*	<input type="checkbox"/> Excavation	<input type="checkbox"/> Lasers*	<input type="checkbox"/> Oxygen Deficiency*	<input type="checkbox"/> Other	
* Does this work require medical clearance or surveillance from the Occupational Medicine Clinic? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					
Environmental Concerns		<input checked="" type="checkbox"/> None	<input type="checkbox"/> Work impacts Environmental Permit No.		
<input type="checkbox"/> Atmospheric Discharges (rad/non-rad)	<input type="checkbox"/> Land Use	<input type="checkbox"/> Soil Activation/contamination	<input type="checkbox"/> Waste-Mixed		
<input type="checkbox"/> Chemical or Rad Material Storage or Use	<input type="checkbox"/> Liquid Discharges	<input type="checkbox"/> Waste-Clean	<input type="checkbox"/> Waste-Radioactive		
<input type="checkbox"/> Cesspools (UIC)	<input type="checkbox"/> Oil/PCB Management	<input type="checkbox"/> Waste-Hazardous	<input type="checkbox"/> Waste-Regulated Medical		
<input type="checkbox"/> High water/power consumption	<input type="checkbox"/> Spill potential	<input type="checkbox"/> Waste-Industrial	<input type="checkbox"/> Underground Duct/Piping		
Waste disposition by:		<input type="checkbox"/> Other			
Pollution Prevention (P2)/Waste Minimization Opportunity:		<input checked="" type="checkbox"/> None <input type="checkbox"/> Yes			
FACILITY CONCERNS		<input checked="" type="checkbox"/> None			
<input type="checkbox"/> Access/Egress Limitations	<input type="checkbox"/> Electrical Noise	<input type="checkbox"/> Potential to Cause a False Alarm		<input type="checkbox"/> Vibrations	
	<input type="checkbox"/> Impacts Facility Use Agreement		<input type="checkbox"/> Temperature Change	<input type="checkbox"/> Other	
<input type="checkbox"/> Configuration Control	<input type="checkbox"/> Maintenance Work on Ventilation Systems		<input type="checkbox"/> Utility Interruptions		
WORK CONTROLS					
Work Practices					
<input type="checkbox"/> None	<input type="checkbox"/> Exhaust Ventilation	<input checked="" type="checkbox"/> Lockout/Tagout	<input type="checkbox"/> Spill Containment	<input type="checkbox"/> Security (see Instruction Sheet)	
<input checked="" type="checkbox"/> Back-up Person/Watch	<input type="checkbox"/> HP Coverage	<input type="checkbox"/> Posting/Warning Signs	<input type="checkbox"/> Time Limitation	<input type="checkbox"/> Other	
<input type="checkbox"/> Barricades	<input type="checkbox"/> IH Survey	<input type="checkbox"/> Scaffolding-requires inspection	<input type="checkbox"/> Warning Alarm (i.e. "high level")		
Protective Equipment					
<input type="checkbox"/> None	<input type="checkbox"/> Ear Plugs	<input type="checkbox"/> Gloves	<input type="checkbox"/> Lab Coat	<input type="checkbox"/> Safety Glasses	
<input type="checkbox"/> Coveralls	<input type="checkbox"/> Ear Muffs	<input type="checkbox"/> Goggles	<input type="checkbox"/> Respirator	<input checked="" type="checkbox"/> Safety Harness	
<input type="checkbox"/> Disposable Clothing	<input type="checkbox"/> Face Shield	<input type="checkbox"/> Hard Hat	<input type="checkbox"/> Shoe Covers	<input checked="" type="checkbox"/> Safety Shoes	<input type="checkbox"/> Other
Permits Required (Permits must be valid when job is scheduled.)					
<input checked="" type="checkbox"/> None	<input type="checkbox"/> Cutting/Welding	<input type="checkbox"/> Impair Fire Protection Systems			
<input type="checkbox"/> Concrete/Masonry Penetration	<input type="checkbox"/> Digging/Core Drilling	<input type="checkbox"/> Rad Work Permit-RWP No			
<input type="checkbox"/> Confined Space Entry	<input type="checkbox"/> Electrical Working Hot	<input type="checkbox"/> Other			
Dosimetry/Monitoring					
<input checked="" type="checkbox"/> None	<input type="checkbox"/> Heat Stress Monitor	<input type="checkbox"/> Real Time Monitor	<input type="checkbox"/> TLD		
<input type="checkbox"/> Air Effluent	<input type="checkbox"/> Noise Survey/Dosimeter	<input type="checkbox"/> Self-reading Pencil Dosimeter	<input type="checkbox"/> Waste Characterization		
<input type="checkbox"/> Ground Water	<input type="checkbox"/> O ₂ /Combustible Gas	<input type="checkbox"/> Self-reading Digital Dosimeter	<input type="checkbox"/> Other		
<input type="checkbox"/> Liquid Effluent	<input type="checkbox"/> Passive Vapor Monitor	<input type="checkbox"/> Sorbent Tube/Filter Pump			
Training Requirements (List below specific training requirements)					
PHENIX Awareness, LOTO affected, RHIC Access, working at heights,					
Based on analysis above, the Walkdown Team determines the risk, complexity, and coordination ratings below:			If using the permit when all hazard ratings are low, only the following need to sign: (Although allowed, there is no need to use back of form)		
ES&H Risk Level:	<input checked="" type="checkbox"/> Low	<input type="checkbox"/> Moderate	<input type="checkbox"/> High	WCC:	Date:
Complexity Level:	<input type="checkbox"/> Low	<input checked="" type="checkbox"/> Moderate	<input type="checkbox"/> High	Service Provider:	Date:
Work Coordination:	<input type="checkbox"/> Low	<input checked="" type="checkbox"/> Moderate	<input type="checkbox"/> High	Authorization to start	Date:
(Departmental Sup/WCC/Designee)					

3. Both work requester and service provider contribute to work plan (use attachments for detailed plans)

Work Plan (procedures, timing, equipment, and personnel availability need to be addressed): See attached procedure. <i>Note: This work permit is essentially identical to the work permit # SS-2005-197. Due to the influx of funding to re-instate RHIC Run 6, The work described in SS-2005-197 which was supposed to be concluded by 4/30/06 is now planned to be re-started 7/17/06 and completed by 9/15/06.</i>				
Special Working Conditions Required: No				
Operational Limits Imposed: No				
Post Work Testing Required:				
Job Safety Analysis Required: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			Walkdown Required: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Reviewed by: Primary Reviewer will determine the size of the review team and the other signatures required based on hazards and job complexity. Primary Reviewer signature means that the hazards and risks that could impact ES&H have been identified and will be controlled according to BNL requirements.				
Title	Name (print)	Signature	Life #	Date
Primary Reviewer				
ES&H Professional				
Other				
Other				
Work Control Coordinator	Don Lynch		20146	9/24/2005
Service Provider				
	Review Done: <input type="checkbox"/> in series <input type="checkbox"/> team			

4. Job site personnel fill out this section.

Note: Signature indicates personnel performing work have read and understand the hazards and permit requirements (including any attachments).			
Job Supervisor:		Contractor Supervisor:	
Workers:	Life#:	Workers :	Life#:
Workers are encouraged to provide feedback on ES&H concerns or on ideas for improved job work flow. Use feedback form or space below.			

5. Departmental Job Supervisor, Work Control Coordinator/Designee

Conditions are appropriate to start work: (Permit has been reviewed, work controls are in place and site is ready for job.)			
Name:	Signature:	Life#:	Date:

6. Departmental Job Supervisor, Work Requester/Designee determines if Post Job Review is required. ☐ Yes ☐ No

Post Job Review (Fill in names of reviewers)			
Name:	Signature:	Life#:	Date:
Name:	Signature:	Life#:	Date:

7. Worker provides feedback.

Worker Feedback (use attached sheets as necessary)	
a) WCM/WCC: Is any feedback required? <input type="checkbox"/> Yes <input type="checkbox"/> No	
b) Workers: Are there better methods or safer ways to perform this job in the future? <input type="checkbox"/> Yes <input type="checkbox"/> No	

8. Closeout: Work Control Coordinator (authorizing dept.) checks quality of completed permit and ensures the work site is left in an acceptable condition. (WCC can delegate clean up of work area to work supervisor)

Name:	Signature:	Life#:	Date:
Comments:			

**Install Time of Flight West Detectors
PHENIX IR, Bldg. 1008**

Discussion

A new array of detectors has been designed and built for the PHENIX experiment at the Relativistic Heavy Ion Collider. The design concept for the detectors has been reviewed by appropriate PHENIX technical staff and a safety review by CA safety staff has been conducted during which the concept for this work plan was presented.

The detector is comprised by 4 identical separate enclosures which each house $\frac{1}{4}$ of the detector modules and associated onboard electronics. The enclosures provide a leak tight environment for the detectors which have a 95% R134A 5% Isobutane local gas environment. On the exterior of the enclosure preamp printed circuit boards are attached, from which signal cables and low voltage cables are routed to a common edge of the enclosure. High voltage cables and gas piping are fed to the interior of the enclosures from the same common edge. When mounted this common edge will form the vertical edge of the enclosures, 2 on the north side of the detector array and 2 on the south side. The detector array assembly of the 4 enclosures will be located in the annular space on the west carriage in the vertical sector (sector 2) outboard of the existing Aerogel detector and inboard of Pad Chamber 3.

The detector enclosures will be installed 2 at a time “garage door style” from the top of the west carriage and staged off of the Bridge platform above the central magnet. The detectors will be joined with a set of brackets and long 3” I-beams which support the assembly from above and below. A set of aluminum channels has been installed in the west carriage to guide the descent of the detectors into place, as they are lowered down using 2 steel cables driven by a motor and spool assembly originally fabricated for the (similar) installation of the Pad Chamber detectors.

In order to install the detectors in this manner, 2 seismic restraints on the RICH detector and some local piping for the flammable gas detection system must be temporarily removed. The location of these items is inaccessible from any existing platforms, and as such a custom designed access platform has been designed for this purpose.

The delicate nature of this work dictates that the installation technique be tested and practiced. For that purpose a geometrically similar mock up has been fabricated to exercise the procedure.

This work is to be done by fully trained and experienced PHENIX personnel, under the technical supervision of Sal Marino and the engineering cognizance of Don Lynch. The custom platform is an existing purchased 16’ work platform manufactured by Werner, Inc. and rated for 500 lbs. This platform will not be modified in any way and

will be supported by $\frac{3}{4}$ " steel threaded rod attached to 4" aluminum structural channel below the platform. The threaded rod is supported from two 16' long 4" aluminum structural channels. Access to the Werner platform will be provided via a 6 ft A-frame ladder on the Werner platform secured to the bridge platform.

All persons involved will have appropriate training for working at heights, fall protection and all other relevant training.

Procedure

LOTO the power to the MMS magnet coil at the power supply in 1008B. (Pearson)

Verify that no gas is flowing to any of the chambers. (Biggs)

Assure that the CM is locked in position by locking out the hydraulics to each magnet mover. (Marino)

(Note all persons working on the Bridge platform while any decking is removed shall have appropriate fall protection equipment on and secured to the Bridge structural supports.)

1. Access Platform Installation

- a. Hoist the Werner platform already assembled with its lower channel supports onto the Bridge platform using the IR 1 crane. Also use the crane to hoist the 16' aluminum channel platform supports to the Bridge platform.
- b. Remove the 2 westernmost 2 rows of Bridge platform grating and position the Werner platform such that its south end can be inserted through the opening in the Bridge decking
- c. Insert the Werner platform under the Bridge support beams, gradually moving the Werner platform south interchanging support straps as the platform passes each of the structural supports until the entire platform has been inserted and is under the Bridge.
- d. With the Werner platform just under the Bridge structural beams and fully supported by the crane, attach the four $\frac{3}{4}$ inch threaded rods securely to the lower channel supports. Attach cross bracing at the north and south ends of the platform.
- e. Lower the Werner platform to its desired level then assemble the 16' platform support channels and upper support channels as indicated on the

attached illustrations

- f. Secure a 6 ft A-frame ladder to the structural beams of the Bridge for access and egress to and from the Werner platform.
- g. After the platform is firmly in place and before the platform is used for any access tasks, the installation is to be inspected by CA safety personnel or their designees.

2. Removal of seismic restraints and Flammable gas detection piping

- a. Before removing any of the fasteners holding the RICH seismic restraints, attach the restraint to the IR crane and take any slack up.
- b. From the uppermost “window washer” platform on the west carriage, climb to the top of the structure and reach over to remove the top fasteners from the restraint.
- c. Access the bottom fastener of the restraint from the Werner platform and remove it
- d. Use the crane to hoist the restraint to the Bridge platform where it shall be secured until ready to be reinstalled.
- e. Take digital photos of the flammable gas piping in the area involved in the installation to assist in the reinstallation of this equipment later.
- f. Carefully remove any flammable gas detection piping which would otherwise interfere with the installation process.

3. Mock-up Installation

- a. Install the bottom-most v-block detector support in the sector 2 north and south rails at their design locations.
- b. Install the channel extensions to the uppermost TOF West guide channels at the north and south end .
- c. Install the metal rope drive assembly to the channel extensions and secure to the Bridge structural frame.
- d. Hoist the mockup assembly to the bridge using the IR crane, lower the assembly into the channel extension through the slots provided and continue lowering the mockup until all 4 guide rollers are in the guide rail and contacting the guide surface.

- e. Attach the wire ropes to the north and south eyebolts, reverse the drive to remove any slack in the wires until the full load is on the wire ropes.
- f. Remove the IR crane sling and lift the IR crane away from the work area and stow the hook at its highest point.
- g. Switch the wire rope drive to its normal direction and slowly lower the mockup to its final destination, stopping periodically to check for any snags or unexpected interferences. Note any problems or irregularities.
- h. When the lower roller wheels contact the support v-blocks, install the upper v-blocks to fully support the mockup.
- i. Remove the wire ropes and practice retracting wire ropes.
- j. Check the adjusting capabilities of the v-blocks and associated adjustment hardware for travel and suitability for the task. Note any problems or irregularities.
- k. Lower the wire ropes back to the mockup and reattach.
- l. Remove the upper v-blocks and upper adjustment hardware.
- m. Hoist the mockup back up the guide rails until it reaches its upper limit of travel in the channel extensions.

4. Evaluate Installation Procedure

Based on the experience evaluate the procedure described above and its probability of success in installing the actual detectors. If necessary, revise the procedure above and or installation fixtures, adjusting hardware etc. as appropriate. Record any minor changes or corrections on a separate sheet and attach to the work permit. Any major changes in procedure or equipment design shall require a new work permit. After any changes are made step 3 and all substeps shall be repeated to verify the revised procedure unless deemed unnecessary by the cognizant engineer.

5. Pre-Detector Installation Test

After completion of the mockup test, it is expected that there will be a period of time before the actual detector is ready for installation. The cognizant engineer in consultation with CA safety representatives or their designees shall determine what steps are necessary to maintain the installation setup in a safe condition. In no event shall the equipment designed for the TOF West installation be used for other purposes unless a detailed separate approved work order is in place.

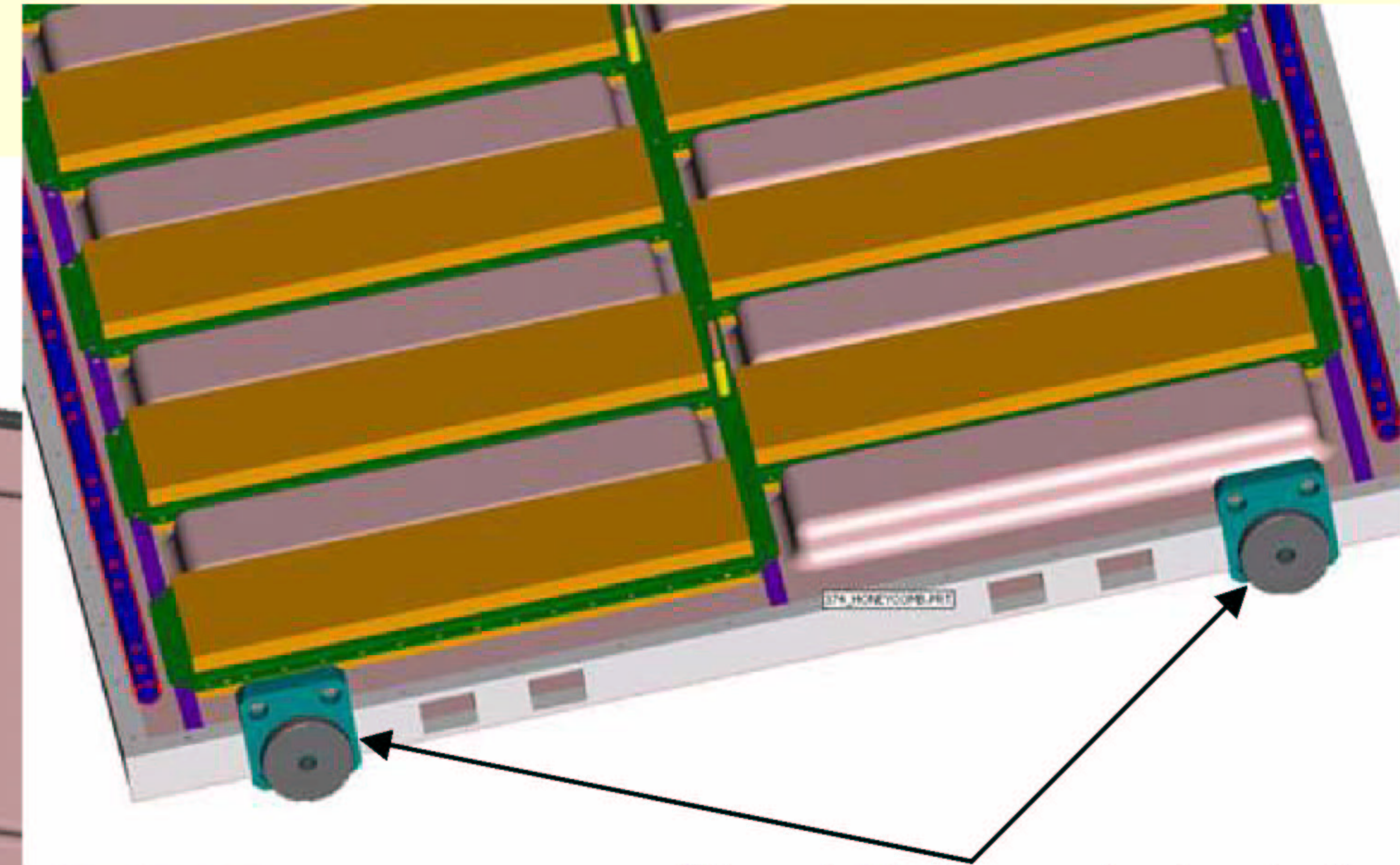
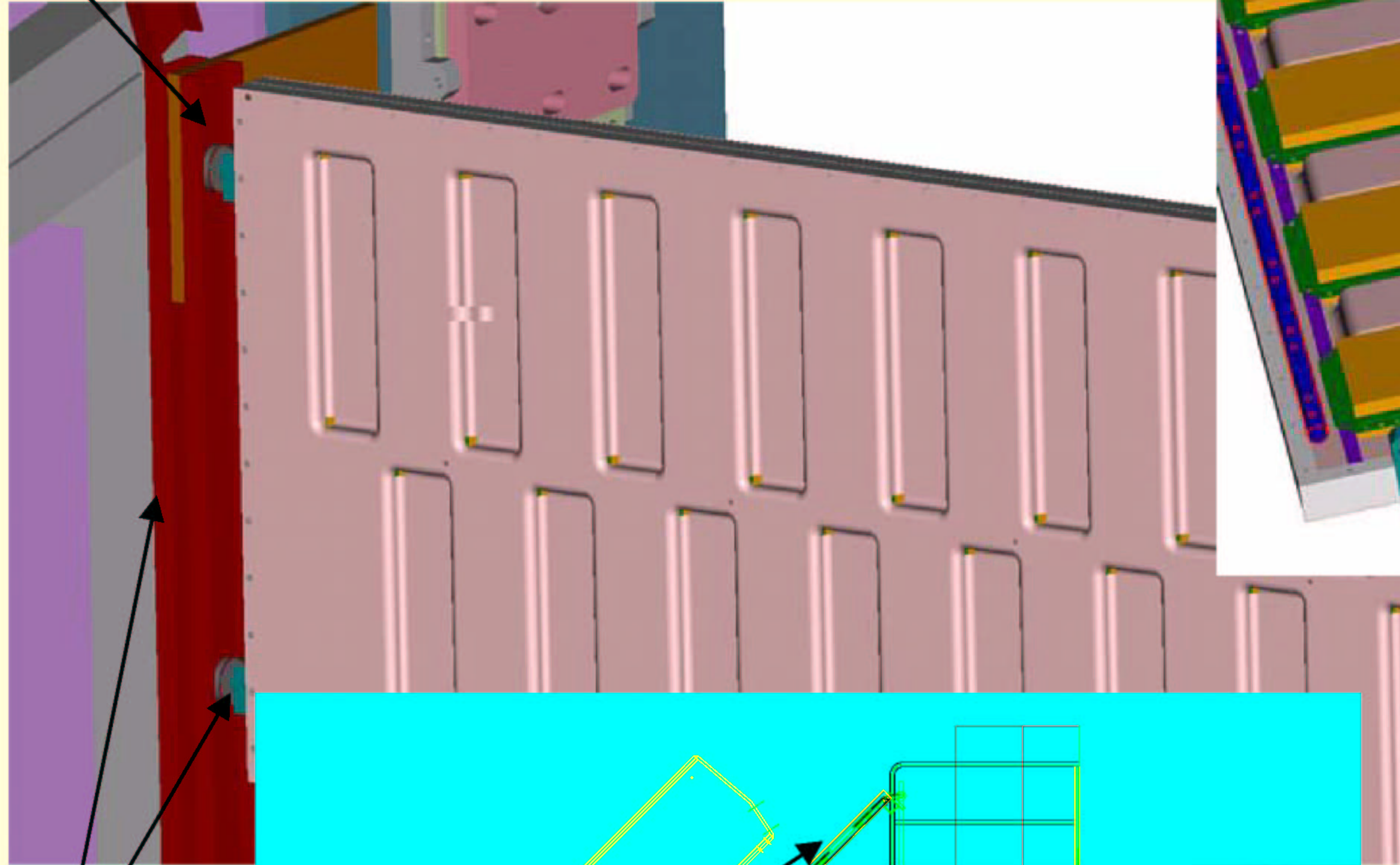
6. Detector Installation

- a. Follow the verified procedure used for the mockup to install the lower detector half to the point where the upper adjustment v-block supports are installed.
- b. Detach the wire rope from the upper ibeam..
- c. Retract the wire ropes to the Bridge.
- d. Install the lower v-block support for the upper detector half on both the north and the south ends.
- e. Attach the upper I-beam to the upper detector half and hoist the assembly to the extension channels and lower the assembly until all 4 rollers are contacting the guide rail channels.
- f. Lower the upper half of the detector assembly into place as before until nested lower v-block supports.
- g. Remove the wire ropes from the upper I-beam and retract the ropes back into their respective spools.
- h. Survey and adjust the v-block support adjustments as necessary to align the detectors within their required specifications.
- i. Disassemble the installation fixtures in the reverse order that they were installed (as described above).
- j. Reinstall the RICH seismic restraints.
- k. Reinstall the flammable gas detector piping and instrumentation, referring to the photos of the original installation for guidance.
- l. Remove the Werner platform by following the above installation procedure in reverse.

Refer to the attached illustrations for further information.

Installation

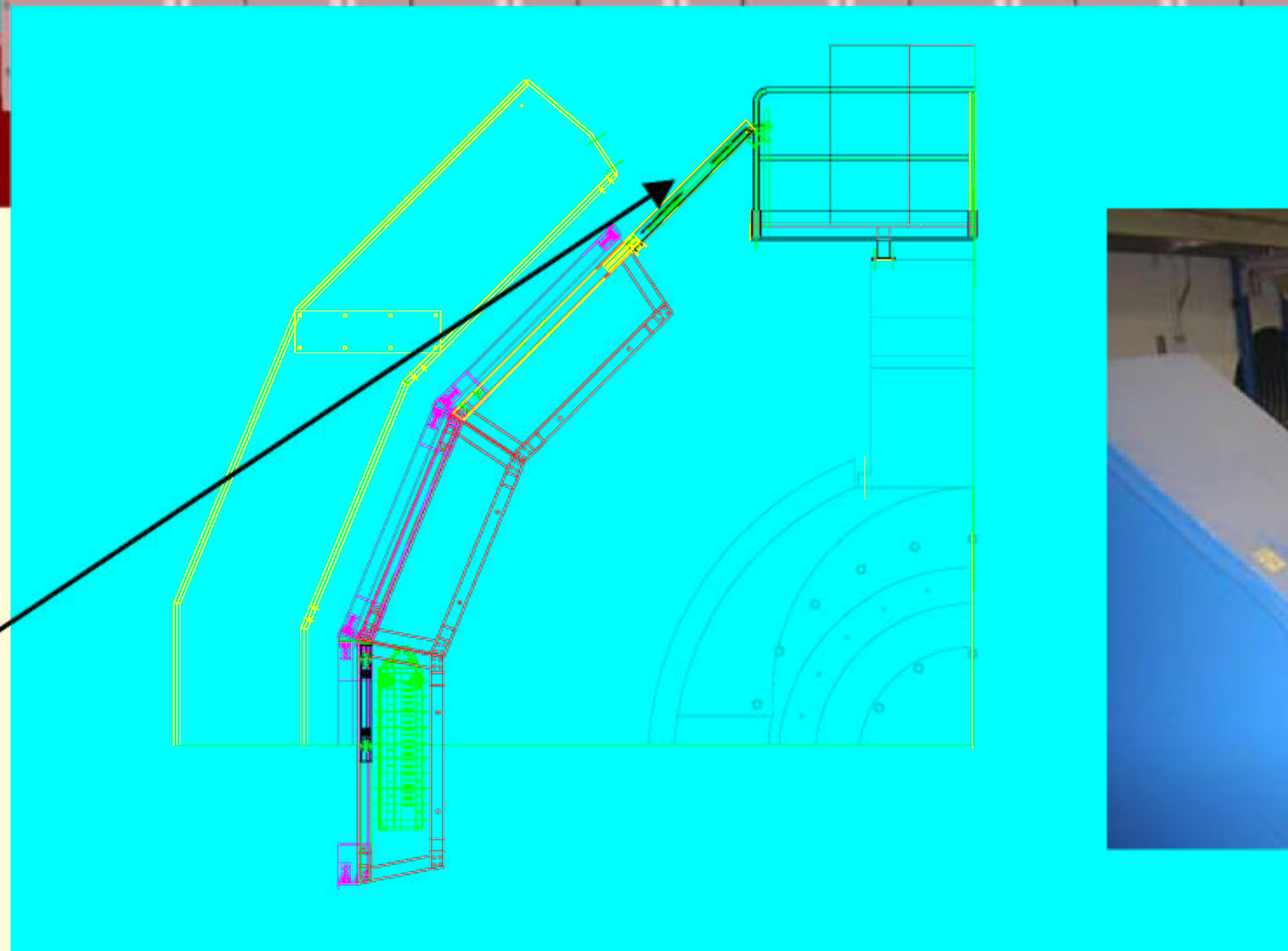
Alum. Channel
"Guide Track"



Steel Rollers to install via
channel/rails then serve as
mounting points for detector
assembly

Rollers

Rail extension
to Bridge for
staging of
installation.



Remove seismic
restraints to
insert "garage
door"

Don Lynch
9/15/05



TOF West Safety Review